chain rule and implicit differentiation (3.6)

2014-10-23 day 41

HI ASHLEY :D

chain rule and implicit differentiation (3.6)

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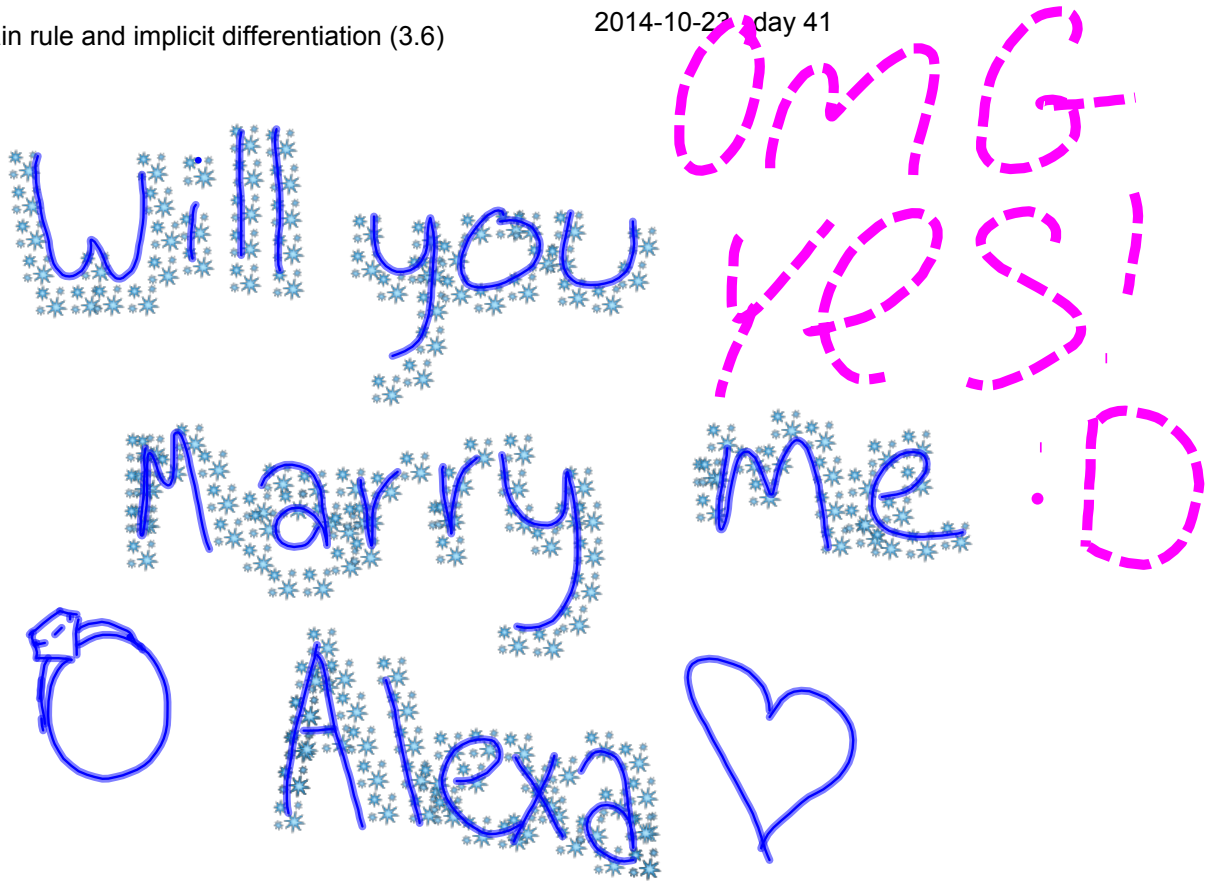

chain rule and implicit differentiation (3.6) 2014-10-23 day 41

2 | 1985

$f(x) = (2x+1)^4$ [chain rule, 4 times]

$f'(x) = 4(2x+1)^3 \cdot \frac{d}{dx}(2x+1)$

$f''(x) = 4 \cdot 3(2x+1)^2 \cdot 2 \cdot \left(\frac{d}{dx}(2x+1)\right)$

$f'''(x) = 4 \cdot 3 \cdot 2(2x+1)^1 \cdot 2 \cdot 2 \cdot \frac{d}{dx}(2x+1)$

$f^{IV}(x) = 4 \cdot 3 \cdot 2 \cdot 1 (2x+1)^0 \cdot 2 \cdot 2 \cdot 2 \cdot \frac{d}{dx}(2x+1)$

$= 24 \cdot 16 = 384$

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3) $y = 3(4+x^2)^{-1}$

$x \mapsto 4+x^2 \mapsto (\ )^{-1}$

$$\frac{dy}{dx} = 3\left[-1\,(4+x^2)^{-2}\frac{d}{dx}(4+x^2)\right]$$

$$= 3\left[-1\,\frac{1}{(4+x^2)^2}(2x)\right]$$

$$= \frac{-6x}{(4+x^2)^2}$$

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start $\frac{dy}{dx} = \cos(2x)$ $y = \frac{1}{2}\sin(2x) + C$

the constant of integration

$\frac{1}{2}(f(x) = y \approx \sin(2x))$

$f'(x) = \cos(2x) \cdot \frac{d}{dx}(2x)$

$\cos(2x) \cdot 2$

$= (2\cos(2x))\frac{1}{2}$

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$$5)\ \lim_{n\to\infty} \frac{4n^2}{n^2+10000n} = \lim_{n\to\infty} \frac{n^2(4)}{n^2\left(1+\frac{10000}{n}\right)}$$

$$= \lim_{n\to\infty} \frac{4}{1+\frac{10000}{n}} = \frac{4}{1+0} = 4$$

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6) $f(x) = x$

$f'(x) = 1$

$f'(1) = 1$

$f'(2) = 1$

$f'(5) = 1$

$f'(100000000000) = 1$

$f'(-10) = 1$

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10) $y = 10^{(x^2-1)}$

$y = \left(e^{\ln 10}\right)^{(x^2-1)}$

$= e^{(\ln 10)(x^2-1)}$

$x \longmapsto (x^2-1)(\ln 10) \longmapsto e^{(\ )}$

$y' = e^{((x^2-1)\ln(10))} \frac{d}{dx}\left((x^2-1)(\ln 10)\right)$

$= 10^{(x^2-1)} \left[(\ln 10)\frac{d}{dx}(x^2-1)\right]$

$= 10^{(x^2-1)} (\ln 10)(2x)$

I know....

$\frac{d}{dx}(x^n) = nx^{n-1}$

new rule

$\frac{d}{dx}(e^x) = e^x$

acceleration = first derivative of velocity = second deriv of position

11) $s(t) = t^2 + 4t + 4$

$v(t) = 2t + 4$

$a(t) = \boxed{2}$

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pre calculus

12, 15, 19 (although you don't know it), 21, 35, 36 (but tough),

calculus

16 (you can but you don't know it yet)

18 37

23 41

25

28

29

33

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1985 AB 13

$x^2+xy+y^3=0$, find $\frac{dy}{dx}$

Implicitly defined function

[[eResource: Winplot]]

Geogebra

Always assume $y=f(x)$.

x is the independent variable

y is a dependent variable.

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$x \to y = f(x) = (\ )^3$

$x^2 + xy + y^3 = 0$, find $\frac{dy}{dx}$

$$2x + \left[\frac{d}{dx}(x)\cdot y + x\cdot\frac{d}{dx}(y)\right] + 3(y)^2\cdot\frac{d}{dx}(y) = 0$$

$$2x + y + x\frac{dy}{dx} + 3y^2\frac{dy}{dx} = 0$$

$$-(2x+y) \qquad -(2x+y)$$

$$x\frac{dy}{dx} + 3y^2\frac{dy}{dx} = -(2x+y)$$

$$\frac{dy}{dx}(x+3y^2) = -(2x+y)$$

$$\frac{dy}{dx} = \frac{-(2x+y)}{(x+3y^2)}$$

3.6 implicit differentiation

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18) $y = \cos^2 x - \sin^2 x = \cos(2x)$

$= (\cos x)^2 - (\sin x)^2$

$y' = 2(\cos x)\frac{d}{dx}(\cos x) - 2(\sin x)\frac{d}{dx}(\sin x)$

$= 2(\cos x)(-\sin x) - 2(\sin x)(\cos x)$

$= -4\sin x \cos x$

$= -2\sin(2x)$